

Geographic Variations in Health Care

What do we know and what can be done to improve health system performance?

Health care use varies a lot across countries but also within countries. Some of the very large geographic variations observed cannot be fully explained by differences in need or patient preferences. Governments should step up efforts to ensure better use of health services.

This report provides information on health care use for ten health care activities and offers a range of approaches to promote the delivery of more appropriate levels of care.

Geographic variations in health care use: How large and why is it important?

Whether or not you receive a particular health service depends to a very great extent on the country in which you live – but also on *where you live within a country*.

These variations are not fully explained by differences in patient need or preferences. Either too much care is being delivered in some areas or patients are missing out on treatment they need. Both imply that health systems are not achieving the level of performance they should. A range of policy options are available to promote the delivery of more appropriate levels of care.

Hospital medical admissions rates vary by two-fold or more across and within countries.

As shown for a selected set of high-volume and high-cost health care activities in 13 OECD countries, wide variation in health care use persists across and within countries, even after adjustment for demographic differences (see Box 1 on the scope of the OECD study and

methods). Hospital medical admission rates (without surgery) are twice as high in Israel, Germany or Australia (around or above 12 000 per 100 000 population over 15 years) than in Spain, Portugal, and Canada, where they stand at around or below 6 000 (see Figure 1).

In some countries, variations across geographic areas are even larger than these cross-country differences. In Canada, Portugal, Finland and England, hospital medical admissions rates can be two and three times higher in some areas than in others.

Differences in the supply of hospital beds explain some of these variations in some countries: people are more likely to be hospitalised where the supply of hospital beds is higher. But the availability and quality of primary care can also play an important role. In Canada, hospitalisations for ambulatory-care-sensitive conditions (i.e. conditions that could be managed in primary care) are 60% more frequent in rural areas than in urban ones. In England and Canada, hospital admissions are also more frequent in areas with social deprivation. More can be done to reduce avoidable hospital admissions.

Box 1. Coverage and analysis of health care activities

This report covers ten health care activities: hospital medical admissions, coronary bypass, angioplasty, catheterisation, admission/surgery after hip fracture, knee replacement, knee arthroscopy, caesarean section, hysterectomy, magnetic resonance imaging scan, and computed tomography scan.

Thirteen countries participated in this study: Australia, Belgium, Canada, Czech Republic, Finland, France, Germany, Israel, Italy, Portugal, Spain, Switzerland, and England (United Kingdom). Countries were given the flexibility to choose the most relevant and feasible geographic unit of analysis.

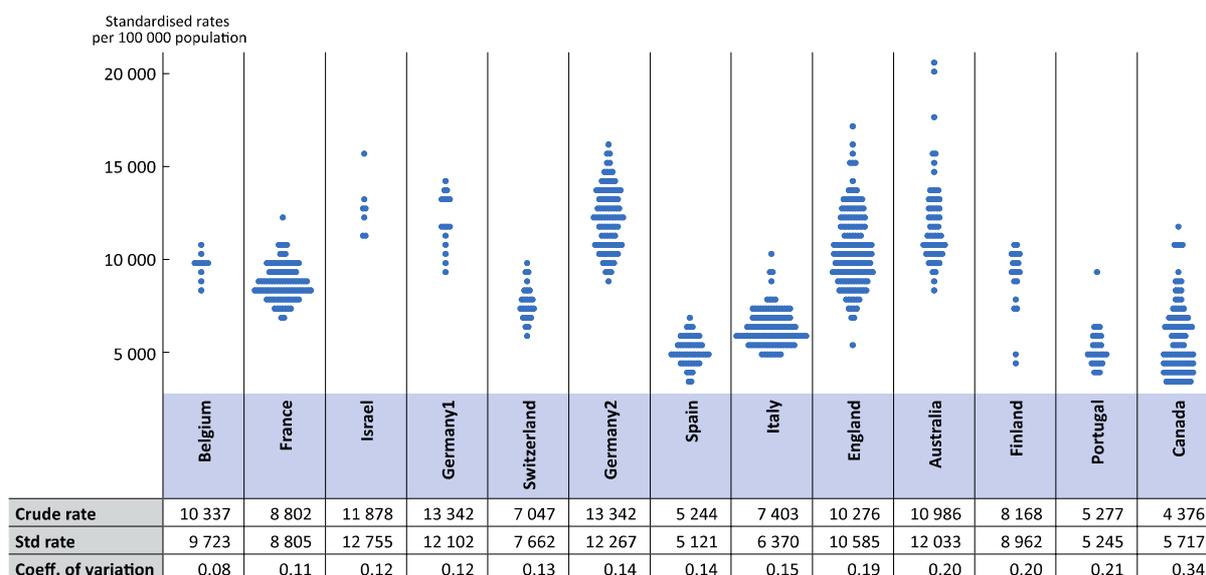
Data used in the report are drawn largely from hospital discharge databases and refer to 2011 or the most recent year available. Utilisation rates are based on the patient's place of residence, with only a few exceptions.

Procedure rates presented in figures 1-4 were standardised using the OECD population structure to remove the effect of differences in population structure both within and across countries. The standardisation by age and sex is expected to remove part of, but not all, the variation explained by morbidity, especially for conditions which are age-dependant.

Measures of variations include:

- The crude rate is the number of cases observed in the country, divided by the country's population;
- The standardised rate is the arithmetic unweighted average of rates computed for a country's geographic areas, all standardised using the OECD population structure;
- Coefficient of variation: the ratio of the standard deviation to the mean of a procedure rate across a number of given territorial units. The higher the coefficient of variation, the greater the dispersion around the mean.

Figure 1. Hospital medical admission rate across and within selected OECD countries, 2011 or latest year



Note: Each dot represents a territorial unit. Rates are standardised using OECD's population >15 years. Countries are ordered from the lowest to highest coefficient of variation within countries. Germany 1 and 2 correspond respectively to Länder and Spatial Planning Regions. Canadian data do not include mental hospital admissions in general hospitals leading to a relatively small under-estimation. Data for Portugal and Spain only include public hospitals. For Spain, the rates are reported based on the province where the hospital is located.

Source: Authors' estimates based on data submitted by countries for the OECD project.

The probability to receive a diagnostic or surgical procedure also varies across and within countries

After adjusting for population differences, knee replacement rates are four times higher in some countries than in others. Variations are also large for cardiac revascularisation procedures. They vary by more than three-fold across countries and have the highest level of within-country variation for more than half of the countries in the study. MRI and CT scan rates also show high variation both across and within countries.

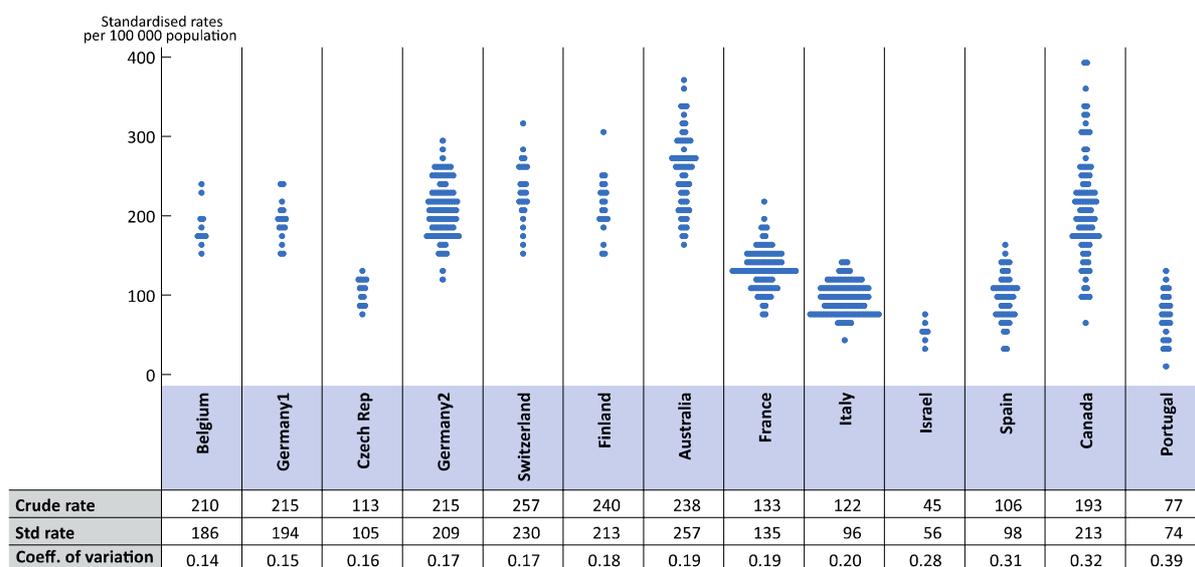
Knee replacement rates display very high geographic variations

Knee replacement rates are on the rise in many countries, due to increases in the prevalence of osteoporosis and changes in clinical guidelines. Over the last decade, they have increased by 50% in Israel, 80% in Finland and Spain, and have doubled in Portugal. In most countries, variations across geographic areas have increased or remained stable over this period.

Knee replacement rates are four times higher in Australia, Switzerland, Finland, Canada and Germany (200 knee replacements per 100 000 people) than in Israel and Portugal (56 and 75 per 100 000 population, respectively). Variations across geographical areas in countries are also very large. In most countries, knee replacement rates vary by two- to three-fold across geographic areas. Variations are larger in Canada, Portugal and Spain. In Canada for instance, the region with the highest rate (397 per 100 000 population) counts more than five-fold more knee replacements than the region with the lowest rate (70 per 100 000).

Here again, variations are not all explained by medical needs. Instead, medical practice styles (in Canada and the United States) or demand characteristics have an influence. Studies using regional data have shown that people living in areas with lower socio-economic status or lower population density are more likely to undergo knee replacement. Somehow paradoxically, a US study using individual data shows that, after adjustment by clinical need, people with lower education are less likely to undergo knee replacement. These conclusions raise questions on appropriateness and access to this procedure.

Figure 2. Knee replacement rate across and within selected OECD countries, 2011 or latest year



Note: Each dot represents a territorial unit. Rates are standardised using OECD's population over 15 years. Countries are ordered from the lowest to highest coefficient of variation within countries. Data for Portugal and Spain only include public hospitals. For Spain, the rates are reported based on the province where the hospital is located. Germany 1 and 2 refers respectively to Länder and Spatial Planning Regions.

Source: Authors' estimates based on data submitted by countries for the OECD project.

Caesarean section rates are on the rise but show less variation in most countries

Caesarean section (c-section) rates have been increasing over time in many OECD countries. They only decreased in the last period in Italy and Portugal, starting from relatively high levels.

C-section rates vary across countries; they are as much as 50% higher in Italy, Portugal, Australia, Switzerland and Germany (above 300 per 1 000 live births) than in Finland (181 per 1 000 live births).

Within-country, geographic variations for c-sections are often lower than for other surgical procedures studied in this report. Belgium has the lowest level of variations, but the highest provincial rate is nevertheless 30% higher than the lowest one. C-section rates vary by two times across geographical areas in Canada, Finland, Germany and Switzerland, and even more than three times across Spanish provinces. Within-country variations are particularly high in Italy where some provinces, especially in the south, have rates six times higher than others.

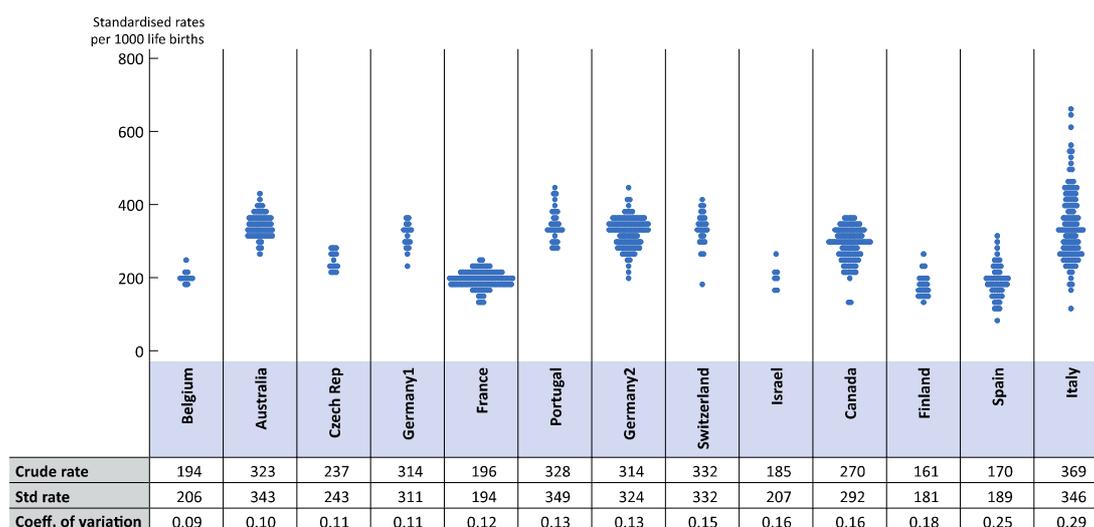
While c-sections have been increasing over the last decade in most countries, variations across geographic areas either did not change considerably (e.g. Canada, Czech Republic, Italy and Spain) or decreased (e.g. France, Portugal

and Switzerland). Only Israel and Finland (to a lesser degree) observed an increase in variation across geographic areas.

Several studies suggest that variations in c-section rates are not fully explained by clinical needs, but also linked to supply and demand-related factors. On the supply-side, private-for-profit hospitals have been shown to perform more c-sections than public hospitals in France, Italy, Spain and Switzerland. Physicians' practice styles play a role in the United States, while in rural regions of Finland, high c-section rates might be explained by the fact that small hospitals do not have enough resources to cope with potential emergencies. On the demand side, women with high socio-economic status tend to be more likely to give birth by c-section in many countries. In Spain, this can be partly explained by a more frequent use of private hospitals by highly-educated women.

Unwarranted variations in c-sections are certainly a cause of concern, from a medical point of view (clinical guidelines recommend its use only in case of need), but also from an economic point of view (for payers, c-sections are costlier than normal delivery). Italy, Spain, France and England have already implemented policies to reduce unnecessary c-sections (see Box 2).

Figure 3. Caesarean section rate across and within selected OECD countries, 2011 or latest year



Note: Each dot represents a territorial unit. Rates are standardised using Italy's population structure of live births according to the mother's age. Countries are ordered from the lowest to highest coefficient of variation within countries. Rates include emergency and non-emergency caesarean sections. Data for Portugal only include public hospitals. Spanish data only include public hospital leading to a 30% underestimation of caesarean sections. For Spain, the rates are reported based on the province where the hospital is located. Germany 1 and 2 refers respectively to Länder and Spatial Planning Regions.

Source: Authors' estimates based on data submitted by countries for the OECD project.

Variations in hysterectomy rates are relatively high, in a context of declining use of this intervention

The prevalence of hysterectomy is generally decreasing in OECD countries thanks to the introduction of less invasive treatment practices. Hysterectomy rates declined in all countries participating in this study, for example by 11% in France, and 40% in Finland. However, this trend was not uniform across geographic areas.

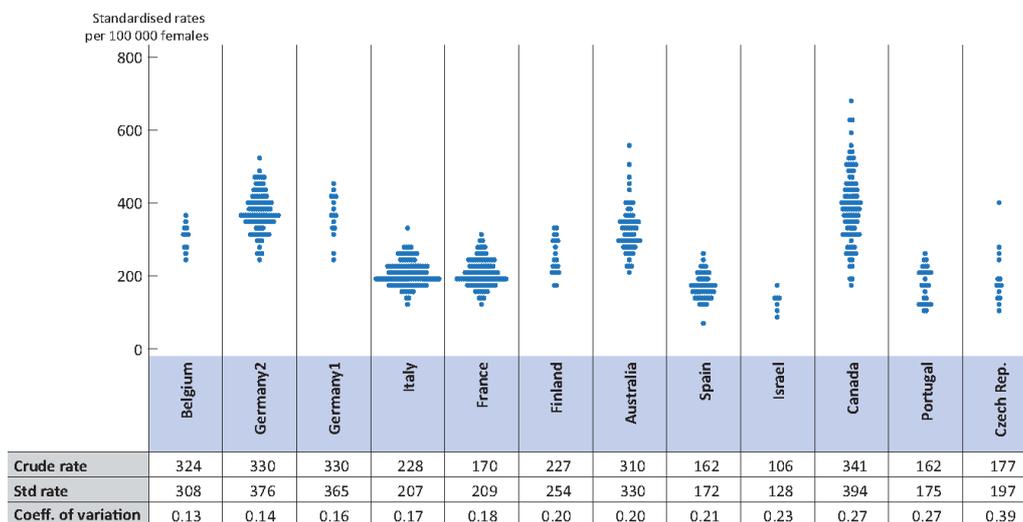
The prevalence of hysterectomy is almost two times higher in Canada and Germany (350 per 100 000 females) than in Israel, Spain, Portugal or the Czech Republic (less than 200 per 100 000 females).

Most countries have two- to three-fold variation across geographic areas. Canada and the Czech Republic have higher levels of variation (close to four-fold), due to some extreme values in certain areas: nearly 400 in one region in the Czech Republic and above 600 per 100 000 females in certain regions in Canada. In most countries included in study, variations across geographic areas were stable or increased.

Earlier studies and evidence gathered in this report show that medical need does not explain all the differences observed. Women with low-education and low-income tend to have higher rates of hysterectomies in some countries (in Australia and England) but not in others (Belgium, Italy). In Canada, rates were lower in both the least affluent and the most affluent neighbourhoods compared with women in middle-income groups. Rates are lower in rural settings than in urban settings in Australia and Canada. In Canada this may be due to greater access to other treatment options for women living in urban areas. On the supply-side there is no clear relationship between density of health care supply (e.g. gynaecologists and gynaecological beds) and hysterectomy rates. Medical practice styles have been shown to play a role in Canada.

While the overall reduction in hysterectomies observed in this study suggests that there may be greater convergence in clinical practice among countries, high rates in certain geographic areas *continue to raise* questions about the appropriateness of care.

Figure 4. Hysterectomy rate across and within selected OECD countries, 2011 or latest year



Notes: Each dot represents a territorial unit. Rates are standardised using OECD's female population >15 years. Countries are ordered from the lowest to highest coefficient of variation within countries. Data for Portugal and Spain only include public hospitals. For Spain, the rates are reported based for the province where the hospital is located. Germany 1 and 2 refers to Länder and Spatial Planning Regions.

Source: Authors' estimates based on data submitted by countries for the OECD project.

Policy options to reduce unwarranted variations in health care use

The primary objective of health policies is to promote appropriate care, including by responding better to patient preferences. A number of interventions or initiatives can have an impact on addressing *unwarranted* variations in health care use.

‘Soft touch’ policies, such as public reporting and target-setting, can be catalysts for change

Public reporting of geographic variations in health care is a first step. Canada, the Netherlands, Spain and the United Kingdom already publish ‘Atlases’ of variations in health care, building on the pioneering work of the Dartmouth Institute for Health Policy and Clinical Practice in the United States.

Table 1. A generation of atlases of health care variations

Country / producers	Description
United States (from 1996) Dartmouth Institute for Health Policy and Clinical Practice	Atlases cover common procedures and treatments and report activities by hospital referral regions (HRRs) for the Medicare population (people aged 65 and over). (http://www.dartmouthatlas.org/publications/reports.aspx).
Canada (from mid-1990s) Institute for Clinical Evaluative Sciences (ICES), Centre for Health Services & Policy Research Atlas (CHSPR), Canadian Institute for Health Information (CIHI)	ICES Atlases cover procedures and conditions for the population of Ontario (most populous Canadian province) (www.ices.on.ca) CHSPR Atlases cover on pharmaceutical prescriptions across Canada and British Columbia (third largest province) (www.chspr.ubc.ca/research-area/pharmaceutical-policy). CIHI reports on variations in selected surgical procedures, hospitalisations and diagnostic procedures, wait times, health status and health outcomes (www.cihi.ca).
Netherlands (from 1999) National Institute of Public Health and the Environment (RIVM), Scientific Institute for Quality of Healthcare and other partners	RIVM Atlas covers public health indicators (www.zorgatlas.nl/). The Dutch Atlas of Healthcare Variation report data on variations in medical practice at the provincial and municipal level for a range of procedures (http://emc3dev.com/depraktijkindex).
Spain (from early 2000) Atlas of Variations in Medical Practice in the Spanish National Health System	Atlases cover many procedures. This initiative was concurrent with changes in the devolution of health care organisation and delivery to the regional governments and allowed for comparative analysis of variations across the country (www.atlasvpm.org/).
Belgium (from 2006) Belgian Healthcare Knowledge Centre, Ministry of Health	The Belgian Healthcare Knowledge Centre published a one-off atlas on a selected set of procedures in 2006, with analyses of determinants of variations (www.kce.fgov.be). The Ministry of Health annual Atlas of pathologies is published by district in hospital admissions for a large number of conditions (www.health.belgium.be)
United Kingdom (from 2010) NHS Right Care	The first NHS Atlas covered more than 30 procedures covering 17 service areas (e.g. cancer, organ donation, diagnostic services) and a number of thematic atlases have been published (e.g. children and young people, kidney disease, diabetes) (www.rightcare.nhs.uk/index.php/nhs-atlas/)
Australia (from 2010) New South Wales Health Care Atlas	The first New South Wales Health Care Atlas published information on medical practice variation across Area Health Service (AHS), based on public and private hospital data, for the period 1 July 2005 to 30 June 2008, (www.atlas.nsw.gov.au/).
Germany (from 2011) Bertelsmann Foundation, Institute of Statutory Health Insurance Physicians	The Bertelsmann Foundation produces atlases which include age- and sex-standardised rates for a number of inpatient procedures and activities at the county level (412 counties /districts) and is part of its Initiative for High-Quality Healthcare (https://faktencheck-gesundheit.de/english-summary/). The Institute of Statutory Health Insurance physicians has undertaken analyses on different regional levels mainly on outpatient care-related activities (e.g. antibiotic drug prescriptions, prevalence of depression, utilisation of screening and office visits). “Versorgungsatlas” (healthcare atlas) (www.versorgungsatlas.de).

These atlases identify potential under or over-use, and raise questions about why such variations take place. Atlases provide the basis for starting discussions and actions involving key stakeholders, notably health care providers, as to why these variations exist and what should be done to address them.

Where relevant, target setting may help to steer health care towards more appropriate levels. For instance, Belgium developed with stakeholders a strategy to reduce exposure to ionising radiation from imaging tests by 25%, with a regional monitoring.

Policies targeting providers can improve the appropriateness of care

The development and monitoring of clinical guidelines is a key policy lever to standardise clinical practices. In almost all countries, physician societies and/or health authorities have produced clinical guidelines for many of the procedures examined in this project. The public expenditure constraints that have recently affected health systems have given an additional impetus to the development of such guidelines. Rigorous monitoring systems may help to promote compliance with the established standards.

In Finland, for instance, the decline in overall hysterectomy rates coincided with the publication of results from a Finnish randomised controlled trial which influenced the national clinical guideline. However, lower surgery rates have not led to lower regional variation, for example, in Finland and Canada. In Germany, the rate of hysterectomies is monitored through a mandatory reporting scheme which encourages discussion among stakeholders but no particular action has occurred thereafter.

Provider-level reporting and feedback, which can be delivered privately to reduce resistance from providers, shows promising results.

In Canada, a recent report by a Cardiac Care Network on variations in the ratio of coronary bypass to coronary angioplasty across different hospitals in Ontario identified opportunities to

improve transparency and consistency in decision-making for coronary revascularisation.

Shared decision-making between patients and providers and patient outcome measurement are key to reduce unwarranted variations

Comparing patient outcomes across geographic areas or over time helps to assess the appropriateness of care. Over-utilisation of health care can lead to diminishing outcomes. Sweden and the United Kingdom have led the way by collecting systematically *patient outcomes* after certain surgical procedures such as knee and hip replacement.

The diffusion of decision aids for patients can help patient preferences to be taken into account. The United States and the United Kingdom publish decision aids for a range of procedures (e.g., knee replacement). These tools complement information provided by physicians and help patients assess the potential benefits and risks of different treatment options. In some cases, they can reduce the use of resource-intensive interventions.

Box 2. A mix of approaches show promise for caesarean section

Italy set regional targets for c-section rates which probably contributed to the reversal of trend in c-section rates in 2012 in the provinces with the highest rates.

In Spain some hospitals used a tool to assess the need for caesarean sections, which led to a small reduction in their use.

In Belgium, hospitals received feedback on variations in c-section rates, which led to a convergence in rates among hospitals with both high and low rates.

A few countries have introduced financial incentives to reduce the use of unnecessary c-sections. France reduced the gap between the prices paid by health insurance for c-sections and normal delivery, while England decided to align the prices of the two procedures. Korea implemented a pay-for-performance scheme for hospitals, which slightly reduced c-section rates.

Did you know?

- Hospital medical admissions rates are twice as high in Australia, Germany, and Israel than in Canada, Portugal and Spain. They also vary by two-fold or more across geographic areas of a country.
- Knee replacement rates are up to four times higher in Australia, Switzerland, Finland, Canada and Germany than in Israel. They also vary across geographic areas of a same country, often by two-to-three folds and up to five-fold across Canadian regions. These variations are influenced by physicians practice styles and socio-economic characteristics of the population.
- The probability of giving birth by c-section is 50% higher in Italy, Portugal, Australia, Switzerland and Germany than in Finland, even after adjustment by the age of the mother. Variations in c-section rates are particularly large across Italian provinces (up to six-fold). C-section rates are higher in private settings and for women with higher economic status.
- Cardiac procedures vary by more than three-fold across countries and have the highest level of variation for more than half of the countries included in this study. They are particularly high for coronary bypass in Spain and Portugal. Revascularisation procedures are lower among people living in regions with low density, low level of education and low-income.
- The prevalence of hysterectomy is 75% higher in Canada and Germany (350 per 100 000 females) than in Israel, Spain, Portugal or the Czech Republic (less than 200 per 100 000 females). Most countries have two- to three-fold variation across geographic areas, but the variation is around four-fold in Canada and the Czech Republic. Hysterectomy is more frequent in women with low-economic status, especially when physicians have greater discretion.

Further Reading

[OECD Health Working Paper No. 61 - International Variations in a Selected Number of Surgical Procedures.](#)

[Corallo AN, Croxford R, Srivastava D, Goodman DC, Stukel TA \(2014\) "A systematic review of medical practice variations in OECD countries", Health Policy, Vol. 114, pp.5-14.](#)

Contacts

Divya Srivastava

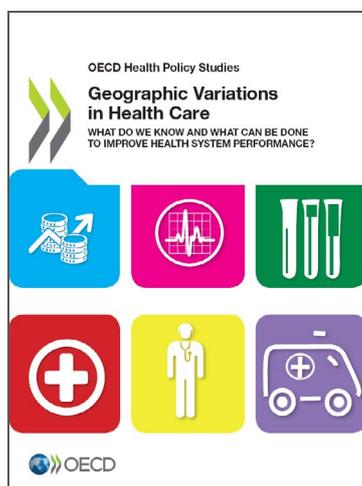
Email: divya.srivastava@oecd.org

Tel: +33 1 45 24 16 36

Valérie Paris

Email: valerie.paris@oecd.org

Tel: +33 1 45 24 80 29



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<http://www.oecd.org/els/health-systems/medical-practice-variations.htm>